



Micronas 6055
10/030,521

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT: Vierthaler et al.

GROUP: 2615

SERIAL NO: 10/030,521

EXAMINER: D. Suthers

FILED: May 10, 2002

FOR: APPARATUS AND METHOD FOR PROCESSING AN AUDIO
SIGNAL TO COMPENSATE FOR THE FREQUENCY RESPONSE OF
LOUDSPEAKERS [as amended]

Commissioner of Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

APPEAL BRIEF

This appeal is in response to the Official Action dated October 2, 2006, which has been made final, the Notice of Appeal filed January 2, 2007 and the Notice of Panel Decision from Pre-Appeal Brief Review dated February 14, 2007. A check including the fee of \$500 pursuant to 37 C.F.R. §41.20(b) is enclosed herewith.

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I. REAL PARTY IN INTEREST

The real party of interest is Micronas GmbH of Freiberg, Germany.

II. RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences.

III. STATUS OF CLAIMS

On January 2, 2007 the appellant appealed from the final rejection of claims 13-21, 24-26 and 29-32 under 35 U.S.C. §103. Claims 22-23 and 27-28 currently stand objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Claims 13-32, which are set forth in Appendix A attached hereto, are all the remaining claims in this application.

IV. STATUS OF AMENDMENTS

No amendments have been filed subsequent to the final rejection.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The invention relates to a radio signal receiver.

Claim 13 recites a method for processing an audio signal. The various elements recited in claim 13 are discussed in the specification in at least the following locations of the Preliminary Amendment submitted by the applicant on February 27, 2006, amongst others:

FEATURES OF CLAIM 13	SPECIFICATION
A method for processing an audio signal, comprising the steps of:	
band-limiting the received audio signal to generate a first intermediate signal;	Page 20, lines 6-7; Page 20, lines 20-21; Page 21, lines 9-11; Page 23, lines 12-13; <i>inter alia</i>
multiplying the first intermediate signal by a correction factor to generate a second intermediate signal;	Page 20, lines 7-9; Page 20, lines 20-21; Page 23, lines 13-14; <i>inter alia</i>
amplifying the second intermediate signal by an amplification factor to generate a third intermediate signal;	Page 20, line 9; Page 20, lines 22 – Page 21, line 2; Page 23, lines 14-15; <i>inter alia</i>
limiting the amplitude of the third intermediate signal to a threshold value to generate a fourth intermediate signal;	Page 20, lines 9-11; Page 21, lines 1-3; Page 23, lines 15-16; <i>inter alia</i>
providing the correction factor as a feedback signal that is a function of the third intermediate signal;	Page 23, lines 6-8; Page 23, lines 18-20; <i>inter alia</i>
band-limiting the fourth intermediate signal to generate a fifth intermediate signal; and	Page 20, lines 11-12; Page 21, lines 3-5; Page 21, lines 14-16; Page 23, lines 17-18; <i>inter alia</i>
adding the fifth intermediate signal to the received audio signal.	Page 20, lines 11-12; Page 21, lines 14-16; Page 22, line 22 – Page 23, line 1; <i>inter alia</i>

Claim 24 recites a circuit for processing an input audio signal. The various elements recited in claim 24 are discussed in the specification in at least the following locations of the Preliminary Amendment submitted by the applicant on February 27, 2006, amongst others:

FEATURES OF CLAIM 24	SPECIFICATION
A circuit for processing an input audio signal received at an input of the circuit to provide at an output of the circuit a processed audio signal, the circuit comprising:	
a first adder having first and second inputs and an output at which the processed audio signal is provided;	Page 20, lines 14-16; Page 22, line 22 – Page 23, line 1; <i>inter alia</i>
a first conductive path connecting the circuit input to the first input of the first adder, where the first conductive path is constructed and arranged to deliver the received audio signal unaltered to the first adder; and	Page 20, lines 14-18; Page 22, lines 21-23 <i>inter alia</i> ;
a second conductive path connecting the circuit input to the second input of the first adder, the second conductive path including,	Page 20, lines 18-20; Page 23, line 1; <i>inter alia</i>
a first bandpass filter having an output and an input connected to the circuit input;	Page 20, lines 20-21; Page 23, line 11; <i>inter alia</i>
a multiplier having a first input connected to the first bandpass filter output, and a second input, and an output;	Page 20, lines 21-22; Page 23, line 2; <i>inter alia</i>
a variable amplifier, having an output and an input connected to the multiplier output, for amplifying a signal received at the amplifier input in accordance with an amplification factor presented at a control input of the amplifier;	Page 20, lines 22-Page 21, line 1; Page 23, line 2; <i>inter alia</i>
a first nonlinear circuit having an output and an input connected to the amplifier output, the nonlinear circuit limiting the amplitude of the amplifier output to a threshold value;	Page 21 lines 1-3; Page 23, lines 2-3; <i>inter alia</i>
a second bandpass filter having an input connected to the nonlinear circuit output and an output defining output of the second conductive path; and	Page 21, lines 3-5; Page 23, lines 2-3; <i>inter alia</i>
a first function generator having an input connected to a control output of the first nonlinear circuit, and an output connected to the second input of the multiplier, where the first function generator provides a feedback signal representative of a correction factor to the second input of the multiplier, and where the feedback signal is a function of a signal at the control output of the first nonlinear circuit.	Page 21, lines 5-7; Page 23, lines 5-11; Page 23, lines 20-21; <i>inter alia</i>

Claim 29 also recites a circuit for processing an input audio signal. The various elements recited in claim 29 are discussed in the specification in at least the following locations of the Preliminary Amendment submitted by the applicant on February 27, 2006, amongst others:

FEATURES OF CLAIM 29	SPECIFICATION
A circuit for processing an input audio signal received at an input of the circuit to provide at an output of the circuit a processed audio signal, the circuit comprising:	
means for band-limiting the received audio signal to generate a first intermediate signal;	Page 20, line 6-7; Page 20, lines 20-21; Page 23, lines 12-13 <i>inter alia</i>
means for multiplying the first intermediate signal by a correction factor to generate a second intermediate signal;	Page 20, lines 7-9; Page 20, lines 21-22; Page 21, lines 11-12; Page 23, lines 13-14 <i>inter alia</i>
means for amplifying the second intermediate signal by an amplification factor to generate a third intermediate signal;	Page 20, lines 7-9; Page 20, lines 22-23; Page 21, lines 11-13; Page 23, lines 14-15; <i>inter alia</i>
means for limiting the amplitude of the third intermediate signal to a threshold value to generate a fourth intermediate signal;	Page 20, lines 9-10; Page 21, lines 1-3; Page 21, lines 11-13; Page 23, lines 15-16; <i>inter alia</i>
means for providing the correction factor as a feedback signal that is a function of the third intermediate signal;	Page 23, lines 6-8; Page 23, lines 18-20; <i>inter alia</i>
means for band-limiting the fourth intermediate signal to generate a fifth intermediate signal; and	Page 20, lines 11-12; Page 21, lines 3-5; Page 21, lines 14-16; Page 23, lines 17-18; <i>inter alia</i>
means for adding the fifth intermediate signal to the received audio signal.	Page 20, lines 11-12; Page 21, lines 14-16; Page 20, lines 14-16; Page 22, line 22 – Page 23, line 1; <i>inter alia</i>

Claim 32 recites a circuit for processing an input audio signal. The various elements recited in claim 32 are discussed in the specification in at least the following locations of the Preliminary Amendment submitted by the applicant on February 27, 2006, amongst others:

FEATURES OF CLAIM 32	SPECIFICATION
A circuit for processing an input audio signal received at an input of the circuit to provide at an output of the circuit a processed audio signal, the circuit comprising:	
a first conductive path through which the received audio signal travels;	Page 20, lines 16-18; Page 22, line 23; <i>inter alia</i>
a second conductive path through which the received audio signal travels, where the audio signal is processed such that harmonics of the signal components with a low-frequency are generated in the second conductive path and are admixed to the signal in the first path, where in the second path the audio signal is sequentially bandpass filtered, weighted with a correction factor, amplified, limited to a threshold value, and bandpass filtered, where the correction factor is reduced when the threshold value is exceeded, and where the correction factor is provided as a feedback signal that is a function of the amplified audio signal.	Page 20, lines 18-Page 21, line 7; Page 21, lines 17-Page 27, line 1; Page 23, line 1-Page 25, line 2; <i>inter alia</i>

VI. GROUND OF REJECTION TO BE REVIEWED ON APPEAL

Whether claims 13-21, 24-26 and 29-32 are obvious in view of the combined subject matter disclosed in U.S. Patent 4,182,930 to Blackmer (hereinafter “Blackmer”) and U.S. Patent 4,000,370 to Smith et al (hereinafter “Smith”).

VII. ARGUMENT

REJECTION UNDER 35 U.S.C. §103(a) – BLACKMER IN VIEW OF SMITH

CLAIM 13

BLACKMER AND SMITH ARE NOT COMBINABLE

Blackmer and Smith relate to different technical problems. Blackmer relates to adding energy to the bass region of a signal (e.g., 40-100 Hz) to increase the energy associated with the bass frequency components of a signal. In contrast, Smith teaches selectively shunting an input signal in order to limit an amplified output signal value. Simply stated, Blackmer is additive (i.e., adds energy to the signal), while Smith is subtractive (i.e., reduces the energy of the signal).

The Official Action recognizes that Blackmer does not disclose a limiter (Official Action, pg. 3). The Official Action then contends that a person of ordinary skill in the art at the time of the invention would use the limiter of Smith to limit the amplified signal of Blackmer. The Official Action contends that the motivation for doing so would be to avoid distortion due to overloading. The Official Action then concludes it would have been obvious to combine Blackmer and Smith to obtain the invention as specified in claim 13. It is respectfully submitted that this combination of references is improper, since a person of ordinary skill in the art would not look to Smith and Blackmer due to their dissimilar technical teachings. Specifically, the qualification circuit 26 of Blackmer checks the frequency range of interest (e.g., 40-100 Hz), and if energy in this frequency range is too low Blackmer adds energy in this frequency range to provide a bass-enhanced output signal. So Blackmer is clearly focused on the problem of there being insufficient energy in the desired frequency range of interest (e.g., 40-100 Hz), rather than too much energy. In contrast, Smith relates to a system that shunts an input signal when the associated output signal becomes too large. It is respectfully submitted that a person of ordinary

skill in the art at the time of the invention would not have combined the subtractive/shunting features of Smith and the additive system architecture such as Blackmer. Again, Blackmer deals with the problem of there being insufficient energy in the bass frequency range of a signal and processes the signal to add energy to the bass frequency range as needed. So a person of ordinary skill in the art would not combine the teachings of Blackmer and Smith since they solve entirely different technical problems.

IF MODIFIED AS SUGGESTED, THE RESULTANT SYSTEM NO LONGER OPERATES FOR THE INTENDED PURPOSE OF BLACKMER

Claim 13 recites a method for processing an audio signal. The method includes the steps of:

“providing the correction factor as a feedback signal that is a function of the third intermediate signal;
band-limiting the fourth intermediate signal to generate a fifth intermediate signal; and
adding the fifth intermediate signal to the received audio signal.” (cl. 13, emphasis added).

The Official Action concludes that “[a]t the time of the invention it would have been obvious to a person of ordinary skill in the art to use the limiter of Smith to limit the amplified signal of Blackmer. The motivation for doing so would have been to avoid distortion due to overloading.” (Official Action, pg. 4). However, it is respectfully submitted that if Blackmer is modified as suggested in the Official Action based upon the alleged teachings of Smith, then the resultant system will no longer operate for the intended purpose of Blackmer.

A stated goal of Blackmer is for improved audio signal reproduction, and in particular “enhancing the signal energy in the predetermined range of frequencies of an audio signal when

the nature of the audio program suggests that such energy was present in the original program.” (col. 1, lines 6-7 and lines 37-41). Blackmer recognizes that *“a great deal of the signal energy in the bass tonal range of frequencies, i.e., between about 20-50 Hz, is lost when audio signals are reproduced after recording or transmission. For greater quality and truer reproduction, it is therefore desirable to synthesize or manufacture the signal energy within this frequency range when the nature of the audio program admits, i.e., when it is likely that this energy was present in the original recorded or transmitted signal.”* (emphasis added, col. 1, lines 10-19). Blackmer selects an audio signal of interest in the frequency range of 40-100 Hz. (col. 2, lines 30-32, 40-42), generates subharmonics of the signals in this frequency range (col. 2, lines 40-51), combines these subharmonics (col. 3, lines 1-3), **and adds the combined subharmonics to the original audio** signal *“to provide an enhanced audio signal at the output terminal.”* (col. 3, lines 3-8). To this end, Blackmer discloses the use of a low-pass filter 38 (FIG. 2) *“to reject all energy above the upper limit of the frequencies of interest,”* which Blackmer defines, in a preferred embodiment, to be above 100 Hz. (col. 4, lines 14-17). Thus, the output of the low-pass filter is energy in the frequency range below 100 Hz.

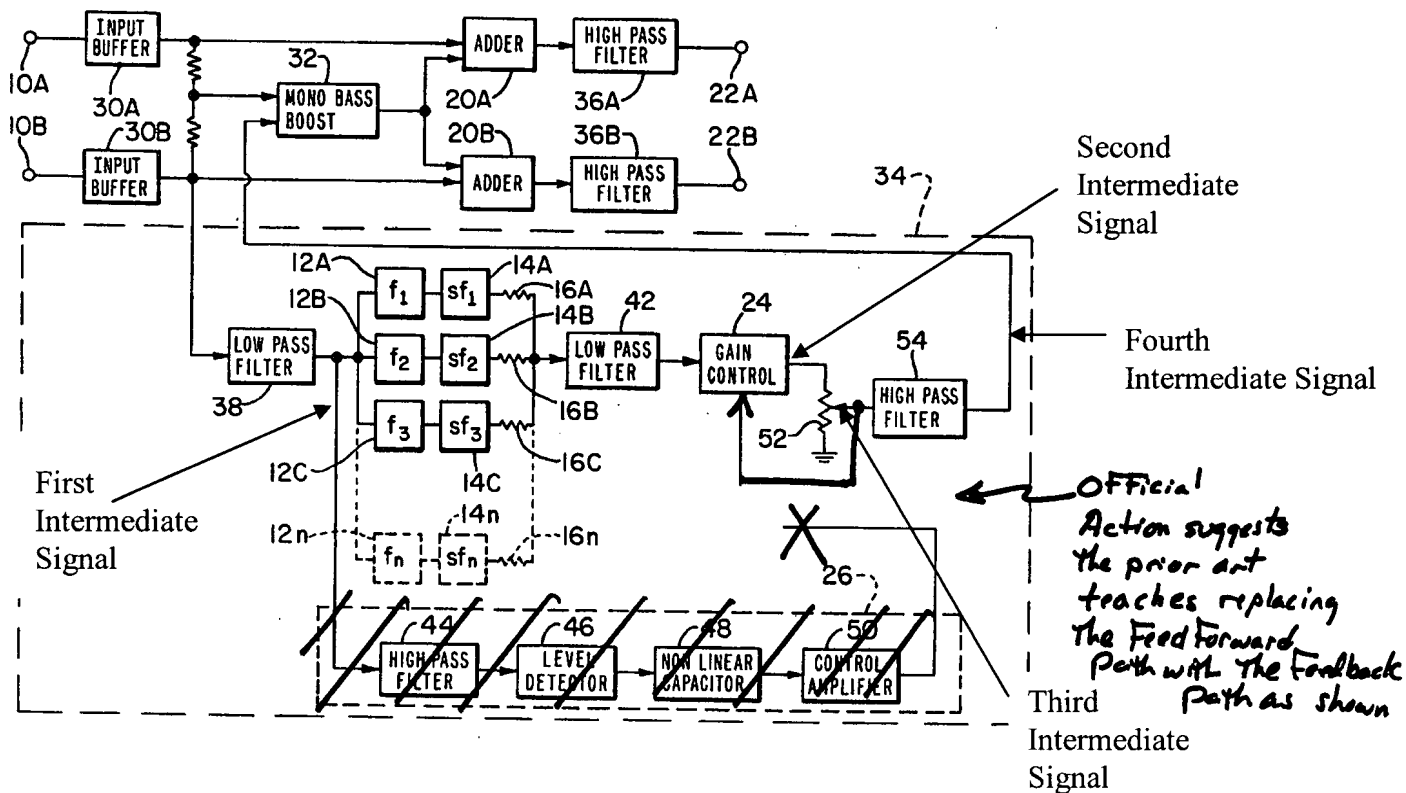
The Official Action contends that the claimed first intermediate signal reads on the output from the low-pass filter 38; that the claimed second intermediate signal reads on the output of the gain control 24; and the claimed third intermediate signal reads on the output of the variable resistor 52. (See page 3 of the Official Action).

As shown in FIG. 2 of Blackmer, a **feed-forward** (and not a **feedback**) connection exists from the output of the low-pass filter 38, through the qualification circuit 26 that comprises a series connection of a high-pass filter 44, a level detector 46, a non-linear capacitor 48, and a control amplifier 50, and then on to the gain control device 24. Blackmer discloses that the high-

pass filter 44 “*rejects all signal energy below the minimum frequency of interest (in the preferred embodiment this minimum frequency being 40 Hz). The output of high pass filter 44 is therefore only signal energy from the two channels between the two frequencies of interest, 40 and 100 Hz.*” (col. 5, lines 3-8). Thus, the high-pass filter 44 is connected in series downstream from the low-pass filter 38, and the effect of these two filters is to produce a signal at the high-pass filter output in the frequency range of 40 Hz to 100 Hz. The high-pass filter output is then fed through the level detector 46, the non-linear capacitor 48 and the control amplifier 50, whose output signal represents the output of the qualification circuit 26 that is provided as a *feedforward* correction factor to the gain control device 24. (FIG. 2; col. 4, lines 65-68). Blackmer teaches that the gain control device 24 “*amplifies or controls the gain of the signal output of filter 42 in proportion to the weighted control signal provided from the qualification circuit 26.*” (col. 4, lines 63-66). Further, Blackmer discloses that “*qualifying circuit 26 together with module 24 determine whether a sufficient amount of energy is present within the frequency range of interest, i.e. between 40 and 100 Hz, and to control the amount of amplification of the subharmonics generated.*” (col. 5, lines 24-28).

So the function of the qualifying circuit 26 (FIGs. 1 and 2) of Blackmer is to *feedforward* a control signal to the gain control 24 based upon the amount of energy of the input signal, input at the terminal 10, within the frequency range of 40 to 100 Hz. However, if Blackmer is modified as set forth in the Official Action to include the alleged teachings of Smith, then the resultant system will no longer *feedforward* a control signal to the gain control 24 based upon the amount of energy within the frequency range of 40 to 100 Hz, and thus the resultant system is incapable of operating for the intended purpose of Blackmer. Specifically, the Official Action contends that Blackmer can be modified to include the feedback feature of Smith to meet the

feature of claim 13 of “*providing the correction factor as a feedback signal that is a function of the third intermediate signal.*” (emphasis added, see Official Action, pg. 4). The Official Action alleges the claimed third intermediate signal reads on the output of the variable resistor 52. But, if Blackmer is modified as suggested in the Official Action, then the control signal to the gain control 24 would be feedback from the variable resistor 52, rather than being fedforward from the output of the low-pass filter 38. A marked-up copy of FIG. 2 of Blackmer is reproduced below to illustrate: (i) how the Official Action is reading the claimed first, second, third and fourth intermediate signals of claim 13 onto the combined structure of Blackmer and Smith, and (ii) the proposed modification of Blackmer that the Official Action alleges a skilled person would have been motivated to make in view of Smith.



It is submitted that if Blackmer is modified as shown above based upon the teachings of Smith, then the resultant system shown above would no longer work for the intended purpose of Blackmer since there is no longer any feed forward control signal to control the gain control 24.

EVEN IF BLACKMER AND SMITH ARE COMBINABLE, THE CLAIMED INVENTION IS STILL NOT OBVIOUS

To further highlight how the combined teachings of Blackmer and Smith fail to suggest the claimed invention, the marked-up copy of FIG. 2 of Blackmer set forth above has been annotated to show how the first, second, third and fourth intermediate signals allegedly read on the structure of Blackmer based upon the contentions in the Official Action (see Official Action, pg. 3 - noticeably missing from the Official Action is any contention regarding how the fifth intermediate signal recited in claim 13 reads on the teachings of the combined references).

THERE IS NO TEACHING IN THE PRIOR ART OF A FIFTH INTERMEDIATE SIGNAL

The Official Action is silent with respect to the fifth intermediate signal feature of claim 12. Specifically, the Official Action fails to consider the claimed invention as a whole, since it fails to address the feature in claim 13 of “*band-limiting the fourth intermediate signal to generate a fifth intermediate signal*,” (emphasis added). Claim 13 also recites the feature of “*adding the fifth intermediate signal to the received audio signal*”. However, the Official Action never alleges what the claimed fifth intermediate signal reads on in the combined teachings of Blackmer and Smith. In addition, the Official Action even mistakenly contends that the references teach adding the fourth intermediate signal to the received audio signal (20B), but this is NOT the claimed invention. Claim 13 recites that the fifth intermediate signal is added to

the received audio signal. Thus, again assuming for the moment without admitting that Blackmer and Smith are even properly combinable, it is respectfully submitted that claim 13 is patentable over the combined teachings of Blackmer and Smith since there is no allegation in the record regarding how the combination of Blackmer and Smith teaches generating a fifth intermediate signal and summing that signal with the audio input signal.

THERE IS NO TEACHING IN THE PRIOR ART OF A CORRECTION FACTOR BEING MULTIPLIED BY THE FIRST INTERMEDIATE SIGNAL

Assuming for the moment without admitting that Blackmer and Smith are even properly combinable, the teachings of the combined references still fail to render the claimed invention obvious. As set forth above, the Official Action contends that the claimed third intermediate signal reads on the output of the variable resistor 52 (see FIG. 2 of Blackmer). Claim 13 recites the step of “*providing the correction factor as a feedback signal that is a function of the third intermediate signal;*”. In addition, claim 13 recites the step of “*multiplying the first intermediate signal by a correction factor to generate a second intermediate signal;*”. Since the Official Action reads the claimed third intermediate signal onto the output of the variable resistor 52 (see FIG. 2) of Blackmer, then in order to establish a prima facie case of obviousness there must be some teaching from the combination of Blackmer and Smith of a correction signal being generated as a function of the third intermediate signal, and the correction factor being multiplied by the first intermediate signal in order to generate the second intermediate signal. However, it is respectfully submitted that even if Blackmer and Smith were properly combinable, the combined teachings still fail to suggest at least the features of the claimed invention set forth in the preceding sentence.

Therefore, it is respectfully requested that the obviousness rejection of claim 13 be withdrawn, and that claim 13 is in condition for allowance and should be passed to issuance.

CLAIM 24

BLACKMER AND SMITH ARE NOT COMBINABLE

Blackmer and Smith relate to different technical problems. Blackmer relates to adding energy to the bass region of a signal (e.g., 40-100 Hz) to increase the energy associated with the bass frequency components of a signal. In contrast, Smith teaches selectively shunting an input signal in order to limit an amplified output signal value. Simply stated, Blackmer is additive (i.e., adds energy to the signal), while Smith is subtractive (i.e., reduces the energy of the signal).

The Official Action recognizes that Blackmer does not disclose a limiter (Official Action, pg. 3). The Official Action then contends that a person of ordinary skill in the art at the time of the invention would use the limiter of Smith to limit the amplified signal of Blackmer. The Official Action contends that the motivation for doing so would be to avoid distortion due to overloading. The Official Action then concludes it would have been obvious to combine Blackmer and Smith to obtain the invention as specified in claim 24. It is respectfully submitted that this combination of references is improper, since a person of ordinary skill in the art would not look to Smith and Blackmer due to their dissimilar technical teachings. Specifically, the qualification circuit 26 of Blackmer checks the frequency range of interest (e.g., 40-100 Hz), and if energy in this frequency range is too low Blackmer adds energy in this frequency range to provide a bass-enhanced output signal. So Blackmer is clearly focused on the problem of there being insufficient energy in the desired frequency range of interest (e.g., 40-100 Hz), rather than too much energy. In contrast, Smith relates to a system that shunts an input signal when the associated output signal becomes too large. It is respectfully submitted that a person of ordinary skill in the art at the time of the invention would not have combined the subtractive/shunting features of Smith and the additive system architecture such as Blackmer. Again, Blackmer deals

with the problem of there being insufficient energy in the bass frequency range of a signal and processes the signal to add energy to the bass frequency range as needed. So a person of ordinary skill in the art would not combine the teachings of Blackmer and Smith since they solve entirely different technical problems.

A PRIMA FACIE CASE OF OBVIOUSNESS HAS NOT BEEN ESTABLISHED

The Official Action admits that “*Blackmer does not expressly disclose the use of the nonlinear circuit and function generator.*” (Official Action, pg. 6). The Official Action contends “*Smith discloses a nonlinear circuit limiting the amplitude of an amplifier output to a threshold value (items 78, 80, 82, 84. column 2, lines 22-29, figure 3) and a first function generator (60, gain function of figure 3) having an input connected to a control output of the first nonlinear circuit, ...where the function generator provides a feedback signal representative of a correction factor...*”. So the Official Action is clearly reading the function generator of claim 24 onto the opto-isolator 60 of Smith. The Official Action contends that a skilled person at the time of the invention would have found it obvious to “*include the limiter of Smith in the circuit of Blackmer*”. (Official Action, pg. 6). However, the Official Action never states how the circuitry of Blackmer would be modified based upon the alleged teachings of Smith. The statement in the Official Action abruptly concludes that it would have obvious to include the limiter of Smith in the circuit of Blackmer, but such a general contention is not enough to establish a prima facie case of obviousness since it fails to recite *how* Blackmer would be modified. That is, the Official Action never makes a reasoned statement regarding how Blackmer would be modified based upon the teachings of Smith in order to allegedly render claim 24 obvious.

EVEN IF BLACKMER AND SMITH ARE COMBINABLE, THE CLAIMED INVENTION IS NOT OBVIOUS

The Official Action also alleges that the claimed first bandpass filter reads on the low pass filter 38. However, it is well known that a low pass filter is not a bandpass filter. A bandpass filter and low pass filter have completely different dynamics. The Official Action is silent with respect to whether a skilled person at the time of the invention would have considered it obvious to substitute the claimed first bandpass filter for the low pass filter 38 (see FIG. 2 of Blackmer) based upon the combined teachings of Blackmer and Smith. Therefore, the Official Action has again failed to consider the claimed invention as a whole.

The Official Action further alleges that the claimed second bandpass filter reads on the high pass filter 54. It is well known that a high pass filter is not a bandpass filter. A bandpass filter and high pass filter have completely different dynamics. The Official Action is silent with respect to whether a skilled person at the time of the invention would have considered it obvious to substitute the claimed second bandpass filter for the high pass filter 54 (see FIG. 2 of Blackmer) based upon the combined teachings of Blackmer and Smith.

CLAIM 29

BLACKMER AND SMITH ARE NOT COMBINABLE

Blackmer and Smith relate to different technical problems. Blackmer relates to adding energy to the bass region of a signal (e.g., 40-100 Hz) to increase the energy associated with the bass frequency components of a signal. In contrast, Smith teaches selectively shunting an input signal to limit an amplified output signal value. Simply stated, Blackmer is additive (i.e., adds energy to the signal), while Smith is subtractive (i.e., reduces the energy of the signal).

The Official Action recognizes that Blackmer does not disclose a limiter (Official Action, pg. 3). The Official Action then contends that a person of ordinary skill in the art at the time of the invention would use the limiter of Smith to limit the amplified signal of Blackmer. The Official Action contends that the motivation for doing so would be to avoid distortion due to overloading. The Official Action then concludes it would have been obvious to combine Blackmer and Smith to obtain the invention as specified in claim 29. It is respectfully submitted that this combination of references is improper, since a person of ordinary skill in the art would not look to Smith and Blackmer due to their dissimilar technical teachings. Specifically, the qualification circuit 26 of Blackmer checks the frequency range of interest (e.g., 40-100 Hz), and if energy in this frequency range is too low Blackmer adds energy in this frequency range to provide a bass-enhanced output signal. So Blackmer is clearly focused on the problem of there being insufficient energy in the desired frequency range of interest (e.g., 40-100 Hz), rather than too much energy. In contrast, Smith relates to a system that shunts an input signal when the associated output signal becomes too large. It is respectfully submitted that a person of ordinary skill in the art at the time of the invention would not have combined the subtractive/shunting features of Smith and the additive system architecture such as Blackmer. Again, Blackmer deals

with the problem of there being insufficient energy in the bass frequency range of a signal and processes the signal to add energy to the bass frequency range as needed. So a person of ordinary skill in the art would not combine the teachings of Blackmer and Smith since they solve entirely different technical problems.

IF MODIFIED AS SUGGESTED, THE RESULTANT SYSTEM NO LONGER OPERATES FOR THE INTENDED PURPOSE OF BLACKMER

The Official Action states “[a]t the time of the invention it would have been obvious to a person of ordinary skill in the art to limit the amplitude of the third signal of Blackmer with the limiter of Smith. The motivation for doing so would have been to avoid distortion due to overloading. Therefore, it would have been obvious to combine Blackmer with Smith to obtain the invention as specified in claim 29.” (Official Action, pg. 8). However, it is respectfully submitted that if Blackmer is modified as suggested in the Official Action based upon the alleged teachings of Smith, then the resultant system will no longer operate for the intended purpose of Blackmer.

A stated goal of Blackmer is for improved audio signal reproduction, and in particular “enhancing the signal energy in the predetermined range of frequencies of an audio signal when the nature of the audio program suggests that such energy was present in the original program.” (col. 1, lines 6-7 and lines 37-41). Blackmer recognizes that “a great deal of the signal energy in the bass tonal range of frequencies, i.e., between about 20-50 Hz, is lost when audio signals are reproduced after recording or transmission. For greater quality and truer reproduction, it is therefore desirable to synthesize or manufacture the signal energy within this frequency range when the nature of the audio program admits, i.e., when it is likely that this energy was present in the original recorded or transmitted signal.” (emphasis added, col. 1, lines 10-19). Blackmer

selects an audio signal of interest in the frequency range of 40-100 Hz. (col. 2, lines 30-32, 40-42), generates subharmonics of the signals in this frequency range (col. 2, lines 40-51), combines these subharmonics (col. 3, lines 1-3), **and adds the combined subharmonics to the original audio** signal “*to provide an enhanced audio signal at the output terminal.*” (col. 3, lines 3-8). To this end, Blackmer discloses the use of a low-pass filter 38 (FIG. 2) “*to reject all energy above the upper limit of the frequencies of interest,*” which Blackmer defines, in a preferred embodiment, to be above 100 Hz. (col. 4, lines 14-17). Thus, the output of the low-pass filter is energy in the frequency range below 100 Hz.

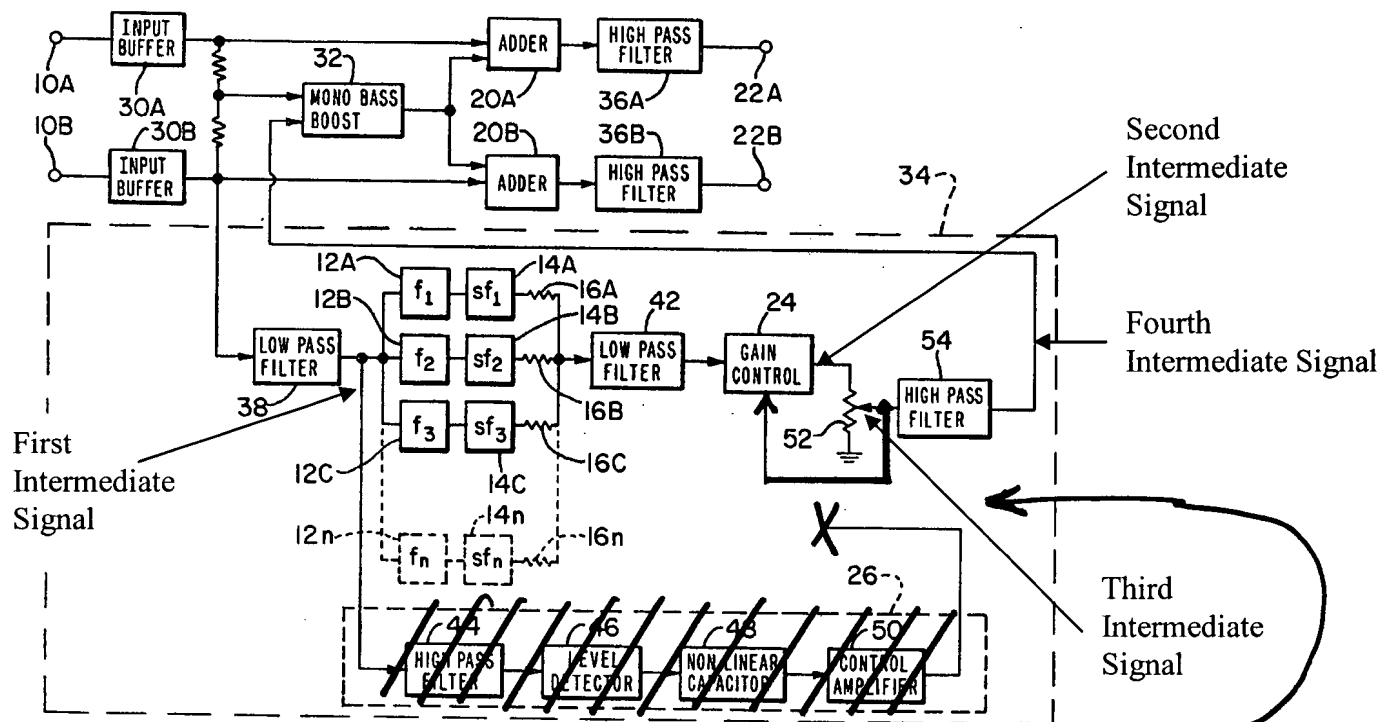
The Official Action contends that the claimed first intermediate signal reads on the output from the low-pass filter 38; that the claimed second intermediate signal reads on the output of the gain control 24; and the claimed third intermediate signal reads on the output of the variable resistor 52. (See page 8 of the Official Action).

As shown in FIG. 2 of Blackmer, a **feed-forward** (and not a **feedback**) connection exists from the output of the low-pass filter 38, through the qualification circuit 26 that comprises a series connection of a high-pass filter 44, a level detector 46, a non-linear capacitor 48, and a control amplifier 50, and then on to the gain control device 24. Blackmer discloses that the high-pass filter 44 “*rejects all signal energy below the minimum frequency of interest (in the preferred embodiment this minimum frequency being 40 Hz). The output of high pass filter 44 is therefore only signal energy from the two channels between the two frequencies of interest, 40 and 100 Hz.*” (col. 5, lines 3-8). Thus, the high-pass filter 44 is connected in series downstream from the low-pass filter 38, and the effect of these two filters is to produce a signal at the high-pass filter output in the frequency range of 40 Hz to 100 Hz. The high-pass filter output is then fed through the level detector 46, the non-linear capacitor 48 and the control amplifier 50, whose output

signal represents the output of the qualification circuit 26 that is provided as a *feedforward* correction factor to the gain control device 24. (FIG. 2; col. 4, lines 65-68). Blackmer teaches that the gain control device 24 “*amplifies or controls the gain of the signal output of filter 42 in proportion to the weighted control signal provided from the qualification circuit 26.*” (col. 4, lines 63-66). Further, Blackmer discloses that “*qualifying circuit 26 together with module 24 determine whether a sufficient amount of energy is present within the frequency range of interest, i.e. between 40 and 100 Hz, and to control the amount of amplification of the subharmonics generated.*” (col. 5, lines 24-28).

So the function of the qualifying circuit 26 (FIGs. 1 and 2) of Blackmer is to feedforward a control signal to the gain control 24 based upon the amount of energy of the input signal (at the terminal 10) within the frequency range of 40 to 100 Hz. However, if Blackmer is modified as set forth on page 8 of the Official Action to include the alleged teachings of Smith, then the resultant system will no longer *feedforward* a gain control signal to the gain control 24 based upon the amount of energy within the frequency range of 40 to 100 Hz, and thus the resultant system is incapable of operating for the intended purpose of Blackmer. Specifically, the Official Action contends that Blackmer can be modified with the feedback feature of Smith to meet the feature of claim 29 of “*means for providing the correction factor (70) as a feedback signal that is a function of an amplified signal.*” (emphasis added, see Official Action, pg. 8). The Official Action also alleges the claimed third intermediate signal reads on the output of the variable resistor 52. But, if Blackmer is modified as suggested in the Official Action, then the control signal to the gain control 24 would be feedback from the variable resistor 52, rather than being feedforward from the output of the low-pass filter 38. A marked-up copy of FIG. 2 of Blackmer is reproduced below to illustrate: (i) how the Official Action is reading the claimed first, second,

third and fourth intermediate signals of claim 29 onto the combined structure of Blackmer and Smith, and (ii) the proposed modifications of Blackmer that the Official Action alleges a skilled person would have been motivated to make in view of Smith.



It is submitted that if Blackmer is modified as shown above based upon the teachings of Smith, then the resultant system shown above would no longer work for the intended purpose of Blackmer since there is no longer any feed forward control signal to control the gain control 29.

CLAIM 32

BLACKMER AND SMITH ARE NOT COMBINABLE

Blackmer and Smith relate to different technical problems. Blackmer relates to adding energy to the bass region of a signal (e.g., 40-100 Hz) to increase the energy associated with the bass frequency components of a signal. In contrast, Smith teaches selectively shunting an input signal in order to limit an amplified output signal value. Simply stated, Blackmer is additive (i.e., adds energy to the signal), while Smith is subtractive (i.e., reduces the energy of the signal).

The Official Action recognizes that Blackmer does not disclose a limiter (Official Action, pg. 3). The Official Action then contends that a person of ordinary skill in the art at the time of the invention would use the limiter of Smith to limit the amplified signal of Blackmer. The Official Action contends that the motivation for doing so would be to avoid distortion due to overloading. The Official Action then concludes it would have been obvious to combine Blackmer and Smith to obtain the invention as specified in claim 32. It is respectfully submitted that this combination of references is improper, since a person of ordinary skill in the art would not look to Smith and Blackmer due to their dissimilar technical teachings. Specifically, the qualification circuit 26 of Blackmer checks the frequency range of interest (e.g., 40-100 Hz), and if energy in this frequency range is too low Blackmer adds energy in this frequency range to provide a bass-enhanced output signal. So Blackmer is clearly focused on the problem of there being insufficient energy in the desired frequency range of interest (e.g., 40-100 Hz), rather than too much energy. In contrast, Smith relates to a system that shunts an input signal when the associated output signal becomes too large. It is respectfully submitted that a person of ordinary skill in the art at the time of the invention would not have combined the subtractive/shunting

features of Smith and the additive system architecture such as Blackmer. Again, Blackmer deals with the problem of there being insufficient energy in the bass frequency range of a signal and processes the signal to add energy to the bass frequency range as needed. So a person of ordinary skill in the art would not combine the teachings of Blackmer and Smith since they solve entirely different technical problems.

A PRIMA FACIE CASE OF OBVIOUSNESS HAS NOT BEEN ESTABLISHED

The Official Action admits that “*Blackmer does not expressly disclose the use of a limiter.*” (Official Action, pg. 9). The Official Action contends that a skilled person at the time of the invention would have found it obvious to “*include the limiter of Smith in the circuit of Blackmer*”. (Official Action, pg. 10). However, the Official Action never states how the circuitry of Blackmer would be modified based upon the alleged teachings of Smith. The statement in the Official Action abruptly concludes that it would have obvious to include the limiter of Smith in the circuit of Blackmer, but such a general contention is not enough to establish a prima facie case of obvious since it fails to recite *how* Blackmer would be modified. That is, the Official Action never makes a reasoned statement regarding how Blackmer would be modified based upon the teachings of Smith in order to allegedly render claim 32 obvious.

EVEN IF BLACKMER AND SMITH ARE COMBINABLE, THE CLAIMED INVENTION IS NOT OBVIOUS

The Official Action also alleges that the claimed first bandpass filter reads on the low pass filter 38 (see Official Action, pg. 9). However, it is well known that a low pass filter is not a bandpass filter. A bandpass filter and low pass filter have completely different dynamics. The Official Action is silent with respect to whether a skilled person at the time of the invention

would have considered it obvious to substitute the claimed first bandpass filter for the low pass filter 38 (see FIG. 2 of Blackmer) based upon the combined teachings of Blackmer and Smith. Therefore, the Official Action has again failed to consider the claimed invention as a whole.

The Official Action further alleges that the claimed second bandpass filter reads on the high pass filter 54 (see Official Action, pg. 9). It is well known that a high pass filter is not a bandpass filter. A bandpass filter and high pass filter have completely different dynamics. The Official Action is silent with respect to whether a skilled person at the time of the invention would have considered it obvious to substitute the claimed second bandpass filter for the high pass filter 54 (see FIG. 2 of Blackmer) based upon the combined teachings of Blackmer and Smith.

IF MODIFIED AS SUGGESTED, THE RESULTANT SYSTEM NO LONGER OPERATES FOR THE INTENDED PURPOSE OF BLACKMER

The Official Action states “[a]t the time of the invention it would have been obvious to a person of ordinary skill in the art to include the limiter of Smith in the circuit of Blackmer. The motivation for doing so would have been to avoid distortion due to overloading. Therefore, it would have been obvious to combine Blackmer with Smith to obtain the invention as specified in claim 32.” (Official Action, pg. 10). However, it is respectfully submitted that if Blackmer is modified as suggested in the Official Action based upon the alleged teachings of Smith, then the resultant system will no longer operate for the intended purpose of Blackmer.

A stated goal of Blackmer is for improved audio signal reproduction, and in particular “enhancing the signal energy in the predetermined range of frequencies of an audio signal when the nature of the audio program suggests that such energy was present in the original program.”

(col. 1, lines 6-7 and lines 37-41). Blackmer recognizes that *“a great deal of the signal energy in the bass tonal range of frequencies, i.e., between about 20-50 Hz, is lost when audio signals are reproduced after recording or transmission. For greater quality and truer reproduction, it is therefore desirable to synthesize or manufacture the signal energy within this frequency range when the nature of the audio program admits, i.e., when it is likely that this energy was present in the original recorded or transmitted signal.”* (emphasis added, col. 1, lines 10-19). Blackmer selects an audio signal of interest in the frequency range of 40-100 Hz. (col. 2, lines 30-32, 40-42), generates subharmonics of the signals in this frequency range (col. 2, lines 40-51), combines these subharmonics (col. 3, lines 1-3), **and adds the combined subharmonics to the original audio** signal *“to provide an enhanced audio signal at the output terminal.”* (col. 3, lines 3-8). To this end, Blackmer discloses the use of a low-pass filter 38 (FIG. 2) *“to reject all energy above the upper limit of the frequencies of interest,”* which Blackmer defines, in a preferred embodiment, to be above 100 Hz. (col. 4, lines 14-17). Thus, the output of the low-pass filter is energy in the frequency range below 100 Hz.

As shown in FIG. 2 of Blackmer, a **feed-forward** (and not a **feedback**) connection exists from the output of the low-pass filter 38, through the qualification circuit 26 that comprises a series connection of a high-pass filter 44, a level detector 46, a non-linear capacitor 48, and a control amplifier 50, and then on to the gain control device 24. Blackmer discloses that the high-pass filter 44 *“rejects all signal energy below the minimum frequency of interest (in the preferred embodiment this minimum frequency being 40 Hz). The output of high pass filter 44 is therefore only signal energy from the two channels between the two frequencies of interest, 40 and 100 Hz.”* (col. 5, lines 3-8). Thus, the high-pass filter 44 is connected in series downstream from the low-pass filter 38, and the effect of these two filters is to produce a signal at the high-pass filter

output in the frequency range of 40 Hz to 100 Hz. The high-pass filter output is then fed through the level detector 46, the non-linear capacitor 48 and the control amplifier 50, whose output signal represents the output of the qualification circuit 26 that is provided as a *feedforward* correction factor to the gain control device 24. (FIG. 2; col. 4, lines 65-68). Blackmer teaches that the gain control device 24 “*amplifies or controls the gain of the signal output of filter 42 in proportion to the weighted control signal provided from the qualification circuit 26.*” (col. 4, lines 63-66). Further, Blackmer discloses that “*qualifying circuit 26 together with module 24 determine whether a sufficient amount of energy is present within the frequency range of interest, i.e. between 40 and 100 Hz, and to control the amount of amplification of the subharmonics generated.*” (col. 5, lines 24-28).

So the function of the qualifying circuit 26 (FIGs. 1 and 2) of Blackmer is to feed forward a control signal to the gain control 24 based upon the amount of energy of the input signal (at the terminal 10) within the frequency range of 40 to 100 Hz. However, if Blackmer is modified as set forth on page 10 of the Official Action to include the alleged teachings of Smith, then the resultant system will no longer *feedforward* a gain control signal to the gain control 24 based upon the amount of energy within the frequency range of 40 to 100 Hz, and thus the resultant system is incapable of operating for the intended purpose of Blackmer. Specifically, the Official Action contends that Blackmer can be modified with the feedback feature of Smith to meet the feature of claim 32 of where in the second oath the audio signal is limited to a threshold value (see Official Action, pg. 9). But, as set forth above, if Blackmer is modified as suggested in the Official Action, then the control signal to the gain control 24 would be feedback from the variable resistor 52, rather than being **feedforward** from the output of the low-pass filter 38, in order to generate sub-harmonics of the input signal in the frequency range of interest.

CONCLUSION

For all the foregoing reasons, we submit that the rejection of claims 13-21, 24-26 and 29-32 is erroneous and reversal thereof is respectfully requested.

If there are any additional fees due in connection with the filing of this appeal brief, please charge them to our Deposit Account 50-3381. If a fee is required for any extension of time under 37 C.F.R. §1.136 not accounted for above, such an extension is requested and the fee should be charged to the above Deposit Account.

Respectfully submitted,

A handwritten signature in black ink, reading "Patrick O'Shea". The signature is written in a cursive style with a large, stylized "P" and "O".

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CLAIMS APPENDIX

1. (Cancelled)

2. (Cancelled)

3. (Cancelled)

4. (Cancelled)

5. (Cancelled)

6. (Cancelled)

7. (Cancelled)

8. (Cancelled)

9. (Cancelled)

10. (Cancelled)

11. (Cancelled)

12. (Cancelled)

13. (Previously Presented) A method for processing an audio signal, comprising the steps of:

band-limiting the received audio signal to generate a first intermediate signal;

multiplying the first intermediate signal by a correction factor to generate a second intermediate signal;

amplifying the second intermediate signal by an amplification factor to generate a third intermediate signal;

limiting the amplitude of the third intermediate signal to a threshold value to generate a fourth intermediate signal;

providing the correction factor as a feedback signal that is a function of the third intermediate signal;

band-limiting the fourth intermediate signal to generate a fifth intermediate signal;
and

adding the fifth intermediate signal to the received audio signal.

14. (Previously Presented) The method of claim 13, further comprising the step of:

adjusting the correction factor based on whether the third intermediate signal exceeds the threshold value.

15. (Previously Presented) The method of claim 14, where the step of adjusting the correction factor further comprises the step of:

reducing the correction factor when the third intermediate signal exceeds the threshold value.

16. (Previously Presented) The method of claim 14, where the step of adjusting the correction factor further comprises the step of:

increasing the correction factor when the third intermediate signal is less than the threshold value.

17. (Previously Presented) The method of claim 14, where the step of adjusting the correction factor further comprises the steps of:

generating a control variable based on the amplitude of the third intermediate signal; and

generating the correction factor as a function of the control variable.

18. (Previously Presented) The method of claim 17, where the step of generating the correction factor as a function of the control variable further comprises the step of low-pass filtering the control variable to generate the correction factor.

19. (Previously Presented) The method of claim 13, where the step of limiting the amplitude of the third intermediate signal to a threshold value comprises the steps of:

generating harmonics of low-frequency signal components of the received audio signal;
and

weighting the harmonics with a variable factor.

20. (Previously Presented) The method of claim 19, where the step of weighting the harmonics with a variable factor further comprises the step of:

generating the variable factor as a function of the third intermediate signal.

21. (Previously Presented) The method of claim 19, where the step of generating harmonics further comprises the step of:

increasingly generating harmonics at the beginning of a low-frequency signal.

22. (Previously Presented) The method of claim 20, where the step of generating the variable factor as a function of the third intermediate signal further comprises the steps of:

detecting a peak value of the third intermediate signal in accordance with a predetermined function of the third intermediate signal to generate a sixth intermediate signal;

low-pass filtering the sixth intermediate signal separately with first and second time constants to generate first and second low-pass filtered signals; and

generating a difference signal between the first and second low-pass filtered signals, where the difference signal is generated as the variable factor.

23. (Previously Presented) The method of claim 22, where the step of weighting further comprises the steps of:

determining an absolute value of the third intermediate signal;

multiplying the absolute value of the third intermediate signal with the variable factor to generate a seventh intermediate signal;

adding to the third intermediate signal to the seventh intermediate signal to form an eight intermediate signal; and

limiting amplitudes of the eight intermediate signal to a specified value.

24. (Previously Presented) A circuit for processing an input audio signal received at an input of the circuit to provide at an output of the circuit a processed audio signal, the circuit comprising:

a first adder having first and second inputs and an output at which the processed audio signal is provided;

a first conductive path connecting the circuit input to the first input of the first adder, where the first conductive path is constructed and arranged to deliver the received audio signal unaltered to the first adder; and

a second conductive path connecting the circuit input to the second input of the first adder, the second conductive path including,

a first bandpass filter having an output and an input connected to the circuit input;

a multiplier having a first input connected to the first bandpass filter output, and a second input, and an output;

a variable amplifier, having an output and an input connected to the multiplier output, for amplifying a signal received at the amplifier input in accordance with an amplification factor presented at a control input of the amplifier;

a first nonlinear circuit having an output and an input connected to the amplifier output, the nonlinear circuit limiting the amplitude of the amplifier output to a threshold value;

a second bandpass filter having an input connected to the nonlinear circuit output and an output defining output of the second conductive path; and

a first function generator having an input connected to a control output of the first nonlinear circuit, and an output connected to the second input of the multiplier, where the first function generator provides a feedback signal representative of a correction factor to the second input of the multiplier, and where the feedback signal is a function of a signal at the control output of the first nonlinear circuit.

25. (Previously Presented) The circuit of claim 24, where the first function generator comprises a first low-pass filter.

26. (Previously Presented) The circuit of claim 24, where the first nonlinear circuit further comprises:

a second nonlinear circuit having an input and output connected to the input and output, respectively, of the first nonlinear circuit, a control output defining the control output of the first nonlinear circuit, and a control input to which the second nonlinear circuit is responsive; and

a second function generator having an input connected to the input of the first nonlinear circuit and an output connected to the control input of the second nonlinear circuit.

27. (Previously Presented) The circuit of claim 26, where the second function generator comprises:

a peak value detector circuit having an output and an input connected to the second function generator input;

a second low-pass filter having an output and an input connected to the peak value detector output;

a third low-pass filter having an output and an input connected to the peak value detector output;

a subtractor having first and second inputs connected to the outputs of the second and third low-pass filters, respectively, and an output; and

a first limiter circuit having an input connected to the subtractor output, and an output connected to the control input of the second nonlinear circuit.

28. (Previously Presented) The circuit arrangement of claim 27, where the second nonlinear circuit comprises:

an absolute value forming circuit having an output and an input connected to the first nonlinear circuit input;

a second multiplier having a first input connected to the first limiter circuit output and a second input connected to the absolute value forming circuit output;

a second adder having an output, a first input connected to the first nonlinear circuit input, and a second input connected to the second multiplier output; and

a second limiter circuit having an input connected to the second adder output, a control output connected to the first function generator, and an output connected to the second bandpass filter input.

29. (Previously Presented) A circuit for processing an input audio signal received at an input of the circuit to provide at an output of the circuit a processed audio signal, the circuit comprising:

means for band-limiting the received audio signal to generate a first intermediate signal;

means for multiplying the first intermediate signal by a correction factor to generate a second intermediate signal;

means for amplifying the second intermediate signal by an amplification factor to generate a third intermediate signal;

means for limiting the amplitude of the third intermediate signal to a threshold value to generate a fourth intermediate signal;

means for providing the correction factor as a feedback signal that is a function of the third intermediate signal;

means for band-limiting the fourth intermediate signal to generate a fifth intermediate signal; and

means for adding the fifth intermediate signal to the received audio signal.

30. (Previously Presented) The circuit of claim 29, further comprising:

means for adjusting the correction factor based on whether the third intermediate signal exceeds a predetermined threshold value.

31. (Previously Presented) The circuit of claim 30, where the adjusting means comprises:

means for reducing the correction factor when the third intermediate signal exceeds the predetermined threshold value, and for increasing the correction factor when the third intermediate signal is less than the predetermined threshold value.

32. (Previously Presented) A circuit for processing an input audio signal received at an input of the circuit to provide at an output of the circuit a processed audio signal, the circuit comprising:

a first conductive path through which the received audio signal travels;

a second conductive path through which the received audio signal travels, where the audio signal is processed such that harmonics of the signal components with a low-frequency are generated in the second conductive path and are admixed to the signal in the first path, where in the second path the audio signal is sequentially bandpass filtered, weighted with a correction factor, amplified, limited to a threshold value, and bandpass filtered, where the correction factor is reduced when the threshold value is exceeded, and where the correction factor is provided as a feedback signal that is a function of the amplified audio signal.

EVIDENCE APPENDIX

None

RELATED PROCEEDINGS APPENDIX

None